U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 11.

THE RAPE PLANT:

ITS HISTORY, CULTURE, AND USES

BY

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PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1893.

FARMERS' BULLETINS.

The bulletins of this series may be obtained by applying to the Secretary of Agriculture, Washington, D. C. The following have been previously issued:

Farmers' Bulletin No. 1. The What and Why of Agricultural Experiment Stations. (A brief explanation of the object, origin, and development of the stations, their work in Europe and in the United States, and the operations of the Office of Experiment Stations of the Department of Agriculture.) Prepared by the Office of Experiment Stations. Pp. 16. Issued June, 1889.

Farmers' Bulletin No. 2. The Work of the Agricultural Experiment Stations. (Illustrations of station work in the following lines: Better cows for the dairy; fibrin in milk; bacteria in milk, cream, and butter; silos and silage; alfalfa; and field experiments with fertilizers.) Prepared by the Office of Experiment Stations. Pp. 16. Issued June, 1889.

Farmers' Bulletin No. 3. The Culture of the Sugar Beet. (Treats of the climatic conditions, soil, fertilizers, and cultivation required by the sugar beet, cost of growing, time to harvest, and method of siloing; describes briefly the process of beet-sugar manufacture, and gives statistics of sugar production and consumption.) By H. W. Wiley, chemist of the Department of Agriculture. Pp. 24. Issued March, 1891.

Farmers' Bulletin No. 4. Fungous Diseases of the Grape and their Treatment. (Describes downy mildew, powdery mildew, black rot, and anthracnose of grapes, and gives instructions for their treatment and estimated cost of remedies.) By B. T. Galloway, chief of the Division of Vegetable Pathology. Pp. 12. Issued March, 1891.

Farmers' Bulletin No. 5. Treatment of Smuts of Oats and Wheat. (Describes the smuts of wheat, oats, and barley, the damage they cause, and the various methods of treatment which have been found useful for their prevention.) Prepared by the Division of Vegetable Pathology. Pp. 8. Issued February, 1892.

Farmers' Bulletin No. 6. Tobacco: Instructions for its Cultivation and Curing. Prepared by John M. Estes, special agent. Pp. 8. Issued February, 1892.

Farmers' Bulletin No. 7. Spraying Fruits for Insect Pests and Fungous Diseases, with a Special Consideration of the Subject in its Relation to the Public Health. Prepared by the Divisions of Entomology and Vegetable Pathology. Pp. 20. Issued April, 1892.

Farmers' Bulletin No. 8. Results of Experiments with Inoculation for the Prevention of Hog Cholera. By D. E. Salmon, chief of the Bureau of Animal Industry. Pp. 10. Issued May, 1892.

Farmers' Bulletin No. 9. Milk Fermentations and their Relations to Dairying. Prepared in the Office of Experiment Stations. Pp. 24. Issued July, 1892.

Farmers' Bulletin No. 10. The Russian Thistle and other Troublesome Weeds in the Wheat Region of Minnesota and North and South Dakota. Pp. 16. Issued April, 1893.

THE RAPE PLANT: ITS HISTORY, CULTURE, AND USES.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., May 22, 1893.

SIR: I have the honor to transmit herewith, for publication as a Farmers' Bulletin, an account of the history, culture, and uses of the rape plant, prepared by Thomas Shaw, professor of agriculture in the Ontario Agricultural College, who has conducted a number of important experiments with this plant, and has carefully studied the requirements for its culture in North America. There is good reason to suppose that in many sections of the United States it would be a useful addition to the crops now grown.

Respectfully,

A. W. HARRIS,
Director.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

NEED OF THE RAPE PLANT IN THE UNITED STATES.

Indian corn is unquestionably one of the most useful fodder plants ever bestowed by a kind Providence on the inhabitants of any country, and its value in this respect continually increases with the multiplication of silos. This continent, with its dry and hot summers, would be immeasurably worse off than it is for fodder supplies in the autumn when the pastures fail were it not for the abundance with which corn can be produced. But there is still a season after the corn has been harvested, and before the setting in of winter, during which we must depend solely upon grass as a source of food for our flocks and herds; otherwise we must draw upon winter stores to feed them. The need of some useful fodder plant that will furnish abundant supplies of nutritious pasture at that season has long been recognized, more especially by the farmers of the East, where the pasture grounds are much more circumscribed than in the great West. And this want has been more severely felt in the case of sheep than in that of cattle, owing to the greater difficulty in providing them with suitable supplemental foods at that season. In consequence, millions of sheep and lambs are put

upon a slaughter market during the autumn months in an unfinished condition, to the great loss of the owners, and in the end to the great loss of the nation.

In the judgment of the writer the Dwarf Essex rape is a plant which can be easily grown in many portions of the United States, and which will furnish abundant supplies of succulent, rich, and nutritious pasture at a season of the year when it is sorely needed; and it may be mentioned here that this judgment is based upon a somewhat extensive and intimate experience in growing rape in various ways in recent years, as will be shown in another division of this article.

DESCRIPTION AND HISTORY OF THE RAPE PLANT.

From the nature of the many questions received by the writer from various parts of the continent it is evident that many persons do not even know what the rape plant is. A brief reference, therefore, to the plant and to its history will be in order.

Rape, of the cruciferous genus *Brassica*, is a plant which in the early stages of its growth can not easily be distinguished from the numerous varieties of Swede turnips that are now grown. It usually attains a greater height than the turnip, and has more of stem and leaf growth. But there is a marked contrast in the habits of root growth between these two species of plants; whereas in turnips the roots are bulbous, in rape they are fusiform and stringy. The leaves and stems of rape are the only portions of the plant of any use in furnishing food.

Rape, of which there are several varieties, has long been grown in Europe and other countries, more especially for the oil which is extracted from its seeds, and which is used chiefly for purposes of lubrication and lighting. Several of the species comprise both summer and winter or annual and biennial varieties, the latter being considered more productive of seed than the former. In England and Scotland some of the winter varieties of rape are sown in the early summer and are pastured off by sheep and lambs in the autumn following. The plants are then allowed to mature their seeds the second year. This is notably the case with the Dwarf Essex, the only variety which thus far has proved a marked success on this continent.

The rape plant grows slowly at first, but after a time it pushes ahead rapidly where the conditions are suitable and a large amount of succulent and nutritious foliage is produced. An average crop grown in drills should furnish not less than ten tons per acre, and when the conditions are all favorable it would be quite possible to produce at least 20 tons of green fodder per acre.

Rape is possessed of remarkable fattening properties. The nutritive ration of green rape as given by Wolf is 1:2.9, while that of red clover in blossom is only 1:5.7. When sheep and lambs are turned in upon it, to use a common but expressive phrase, "they soon weigh like lead."

THE RAPE PLANT IN CANADA.

While rape of the Dwarf Essex variety has been grown as a pasture crop in Canada for several years past, it is true, nevertheless, that its growth has until quite recently been narrowly circumscribed. That so useful a fodder plant should not have been introduced at an earlier period may seem strange in a country settled chiefly by people of Anglo-Saxon descent, and that after it had been introduced it did not attract more attention may also evoke some surprise. The explanation will probably be found in the large areas occupied in proportion to the number of sheep kept, in the extent to which grain-growing on virgin soils has arrested the attention of the people, and in the inherent constitutional conservatism of the mind of the average farmer.

INTRODUCTION OF THE RAPE PLANT INTO CANADA.

It is not known when rape was first introduced into Canada, but it is now certain that it has been grown for several years past in the county of Wellington and in one or two of the adjoining counties. In other portions of the Dominion it does not appear to have been grown to any considerable extent, if indeed at all. However, since the bulletins upon rape culture were first issued by this station, it has been ascertained by actual test that rape can be grown in fine form in every province of Canada. A large percentage of the Canadian lambs shipped during the more recent years to the Buffalo market have been finished on rape.

EXPERIENCE WITH RAPE AT GUELPH, CANADA.

The writer was placed in charge of the department of agriculture at the Ontario Agricultural College, Guelph, Canada, in the autumn of 1888. Before that time, so far as can now be ascertained, rape had not been grown upon the farm during any period of its history as an agricultural experiment station. As the farm at that time was infested in an annoying degree with various forms of noxious weed life, the rape plant, it was judged, would prove helpful in cleaning it, owing to the late season at which it might be sown, and to the further fact that it required cultivation to grow it in finest form at a season of the year when such work would be peculiarly fatal to weeds. It was introduced, therefore, at first with this object primarily in view. In 1889 twelve acres of rape were grown at this station. It was sown on ground where thistles grow thick and rank and strong until the middle of June, when they were plowed under, the rape being sown in raised drills that had been formed soon after the land had been plowed. It was pastured off with lambs, and but few thistles were found the following year in the oat crop that came after the rape.

In 1890 fifty-four acres of rape were grown after a crop of rye, a por-

tion of which had been made into silage early in June, and the residue had been cut in the green state with the binder and cured for winter fodder. In the autumn of that year 537 sheep and lambs were fattened upon the rape, 18 head of steers fed upon it for fifty-nine days, and several acres were still left uneaten when winter came.

The following year (1891) one person in thirty-five hours with the spud removed all the noxious weeds from 46 acres of the grain crop that followed the rape. This work was done in the month of June.

In 1891 some 40 acres of rape were grown. It also came after rye, which had been cut about June 1 and cured for winter fodder. About 6 acres were also grown as a catch crop after the grain grown upon the land had been removed. No fewer than 666 lambs pastured upon it for from two to two and one-half months.

In 1892 about 48 acres were grown, but the seed sown on fully two-thirds of this acreage proved untrue to name. It was a hybrid variety, to which further reference is made in the next section. It was not valuable as a pasture, hence we purchased only 376 lambs in 1892, and found that number sufficient to feed off all the rape thus grown, and in addition several acres of the true variety grown as a catch crop after winter wheat.

A large number of plats have also been grown each year by way of experiment. These include the following tests:

(1) Rape grown on different kinds of soil with and without salt; (2) rape grown in drills as against flat cultivation; (3) rape grown in drills as against broadcast seeding; (4) rape grown in drills different distances apart; (5) using different quantities of seed per acre; (6) thinning the plants to different distances in the drills; (7) applying various fertilizers; (8) feeding lambs upon rape grown after a grain crop; (9) testing the amount of pasture furnished by a single crop of rape grown under favorable conditions; (10) pasturing lambs upon rape alone, rape with a supplement of oats, and rape with access to a grass pasture; (11) pasturing swine upon rape alone and with other food adjuncts; (12) feeding rape as a soiling crop to cows giving milk and to various other animals.

Definite results have not been reached as yet in all instances, but up to the present the indications are as follows: (1) That on certain soils salt is a valuable fertilizer for rape; (2) that flat cultivation in drills will probably give somewhat larger returns than ridge cultivation; (3) that larger crops can be obtained from rape sown in drills rather than broadcast; (4) that the distance between the drills is largely dependent upon the soil and the time of sowing; (5) that rape of a superior quality is grown where the plants are not much crowded in the drill; (6) that when not more than 2 pounds of seed per acre are used hand-thinning in the line of the drills will probably not repay the outlay; (7) that nitrate of soda on some soils has a markedly favorable influence on the growth of the plants; (8) that in some seasons a good crop of rape can be grown after a crop of winter wheat has been

removed; (9) that under favorable conditions enormous crops of rape may be grown; (10) that oats do not seem to render much service when fed along with rape that is being pastured by lambs, and that rape and old meadow pasture are superior to rape alone as a pasture for lambs; (11) that rape makes an excellent food for swine when supplemented with more concentrated foods; (12) that rape may be fed under certain conditions to cows giving milk.

Several other phases of the rape problem are being studied at this station, but these may not even be noticed here. It may be advantageous, however, to mention (1) that in our experience of growing rape for four years we have found that 1 acre will pasture 10 to 16 head of lambs from two to two and one-half months, when rye grown for fodder has preceded the rape the same season; (2) that when grown on ground that had not been cropped previously the same season, all the conditions being favorable, we found that 1 acre of rape would pasture 36 to 37 head of lambs for two months; and (3) that the lowest average gain per month made by any considerable number of lambs when pasturing upon rape alone was 7.80 pounds, and the highest 12.60 pounds.

In March, 1891, Bulletin LX, on "The Uses of Rape," was issued by the agricultural department of this station. This bulletin was the first that had appeared on the subject in America. It was followed by another in June, 1892, and so great has been the demand for these that long ago the supply of both was quite exhausted.

DIFFERENT VARIETIES OF RAPE.

By way of experiment three varieties of rape were grown at this station in 1892. These were labeled, respectively, "Dwarf Essex or English Rape," "Broadleaf Dwarf Essex," and "German or Summer Rape." There are good reasons for believing that the variety mentioned second, which is evidently a hybrid, has not been correctly named.

FIG. 1.

The Dwarf Essex or English variety has already been referred to as the only kind of rape which has hitherto proved a success as a fodder plant in North America. Fig. 1 represents a plant as it appeared when taken from the line of one of the rows in the field last autumn, when it had ceased to grow for the season.

The leaves of this variety commence to branch near the surface of the ground, and they extend in every direction until the entire surface

of the soil becomes hidden by a mass of foliage, which varies from 1 to 3 feet in height, according to the soil and season.

FIG. 2.

The proportion of the stem to the leaves is not nearly so great as in the other varieties shown in Figs. 2 and 3, and it should not produce any blossoms the first season.

The hybrid, or so-called Broad-leaf Dwarf Essex, can not be easily distinguished from the true Dwarf Essex during the first weeks of its growth, but after a time the flower-stalk pushes upward. It grew to the height of about 3 feet at this station, and the blossoms began to appear in from six to eight weeks after it was sown. This hybrid variety, which unfortunately was so generally sown in 1892, has been incorrectly represented by various writers as being the same as the Bird Rape.

FIG. 3.

The variety of rape represented in Fig. 2 is probably not more than one-third as valuable for producing fodder as the true Dwarf Essex. It grows far too much stalk in proportion to the foliage, and the stalk soon becomes so woody that sheep will not eat it, but when turned in upon it they soon strip off the blossoms and seed pods.

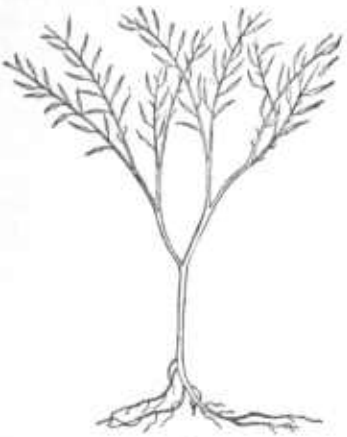

FIG. 4.

The German or Summer-Rape, or as it is more frequently called Bird Rape, differs materially from the varieties shown in Figs. 1 and 2. It differs from the former in the lighter tinge of the leaf, in the small amount of foliage which it produces, and in its running to seed the same season that it is sown. It differs from the latter in its less vigorous growth, in its being more branched, and in the smaller size of the seed pods. Fig. 3 represents a plant of the German or Summer Rape which grew in the greenhouse, as it appeared about eight weeks after the seed had been sown. Fig. 4 represents the same variety of rape

when fully matured, as it appeared in the field plat last autumn. This kind of rape is of no use for pasture.

THE RAPE PLANT IN THE UNITED STATES.

Rape does not appear to have been grown as yet to any great extent in the United States for any purpose. This is rather surprising when we consider the need there is for such a plant on this continent, where climatic and other conditions do not admit of growing turnips and folding sheep upon them as in Great Britain. The writer has been unable to trace the growth of rape in a large way in the United States beyond six or seven years; and yet there can be but little doubt that it has been grown there to some extent for at least a century by individuals in various localities. The explanation is found probably in the great extent of the grass pastures in comparison to the numbers of the sheep grown and in the relatively subordinate place that has hitherto been given to the production of mutton.

ADAPTABILITY OF LARGE AREAS.

The writer has no doubt whatever but that very large areas in the United States are preëminently adapted to growing rape in fine form. The soils of the great prairies will doubtless be found suitable for this crop where the summers are not too dry and warm. And in large sections in all parts where the climatic conditions resemble those of Ontario it will doubtless be found that rape will grow readily. This would mean that rape can be successfully grown in all the States bordering on the Dominion of Canada and in several of those that lie further to the south. Whether it would furnish winter pasture in the more southerly States and whether it would grow seed as a paying crop in these can be determined only by actual test. The heat of the sun in such latitudes would doubtless be fatal to its successful growth in midsummer.

EXPERIENCE IN GROWING RAPE IN THE UNITED STATES.

The testimony given below in reference to growing rape has been directly communicated to the writer by the parties whose names are mentioned. This testimony relates to eight different States, and would have embraced a much larger number but for the fact that nearly all the seed sown in 1892 in the various divisions of the Republic was not true to name. The States referred to are Maine, New York, Pennsylvania, Ohio, Michigan, Wisconsin, Illinois, Minnesota, and South Carolina.

In Maine 3 acres of rape were grown in 1892 by H. R. Gilman, of Exeter. He thinks he is safe in saying that it was the first ever grown in that State. It was a variety which blossomed. It was sown on an over-

turned sod after the removal of the hay. The seed was broadcasted July 5, along with 100 pounds of superphosphate per acre. It all grew nicely, but best where the superphosphate had been most freely applied. The first week in September 50 lambs were put upon it and 50 others three weeks later. They did well on it until the middle of October. This, of course, was the hybrid variety, and yet Mr. Gilman says in regard to it: "I think it fully repaid me for the labor. The lambs ate it, seed, stalk, and all. They seemed to prefer it to good clover feed."

Rape has been successfully grown in New York for a longer or a shorter period by A. Bordwell, of Fargo; Frank D. Ward, of South Byron; C. D. Smead, v. s., of Logan; and E. D. Ramsey, J. H. Potter, and John E. Young, all of Batavia. The names of other growers could be added were it necessary.

Mr. Bordwell has grown English rape for six or seven seasons. He sows in drills 30 inches apart, and gives level culture; sows as early as the middle of April and then again in May and June. The first sown plats are ready for a second cutting by the time the June sowed crop has been fed. He uses it as a soiling crop in fitting sheep and lambs. He says in regard to it: "Have had good success every time. When 18 inches in height the leaves covered the ground."

Mr. Ward grew the true Dwarf Essex rape in 1891 and 1892; sowed it broadcast with the clover seeder on land thoroughly summer fallowed early in the season and manured, covered it with the Thomas smoothing harrow, and then rolled it. For soiling purposes he sows it from April to July, and for pasture from June 20 to July 1; he uses it as pasture for sheep and lambs, and as a soiling crop in fitting show sheep. To the above Mr. Ward adds:

> I have had excellent results—a great growth of nutritious food which bridged over the dry season and kept lambs and show sheep thriving. Rape can not be too highly recommended. It is much superior to any other green food that I know of. I have been laughed at a great deal for sowing my "turnips" so thickly, but when I had tons of excellent fodder, while the critics had nothing but bare timothy for their lambs, the laugh was changed. The best farmers are now sowing considerable rape.

Dr. Smead grew the Dwarf Essex in 1891, and obtained a fine crop. In 1892 the variety sowed by him blossomed, and he considers it only about half as good as the Dwarf Essex. He believes that about May 20 is the best time to sow for August pasture, and in July for late fall pasture. He pastured lambs upon it after weaning, and breeding ewes later. He adds: "I consider it a most valuable dependence during a dry season or as a late fall pasture for sheep."

Mr. Ramsey grew 20 acres of rape on rather poor ground in 1892; sowed the seed about July 15, and the rape was ready for pasturing in September; mixed the seed with ammoniated phosphate, and sowed in rows with the grain drill at a distance of 28 inches apart; used 2 to 2½ pounds of seed per acre, and about 125 pounds of phosphate. In

summing up Mr. Rumsey states: "I have an Englishman working for me who says he never saw better rape in England. I pastured 200 lambs on it in September, October, and until the middle of November. I think it very valuable."

Mr. Potter grew the Dwarf Essex rape in 1892. He sowed it on overturned sod land about the end of June, using 4 pounds of seed to the acre, and says in regard to it: "Rape is the best food I ever saw for sheep."

Mr. Young grew 8 acres in the summer of 1892. He sowed it on sod land overturned; used a grass-seed sower and put in the seed about July 10. He put 290 lambs on the 8 acres on September 16, and it provided pasture for them until November 8; but it should be mentioned that during the last week or two they had some pasture in addition. Within the period mentioned they gained 18½ pounds each. "I am so well pleased with it," says Mr. Young, "that I can not speak too highly of it."

In Pennsylvania rape was grown in 1892 by John I. Gordon, secretary of the American Hampshire Down Association, and by W. A. McCoy, both of Mercer. From the description given by Mr. Gordon, the variety grown in both instances was evidently not the Dwarf Essex, as it went to seed early. In reference to that sown by himself, Mr. Gordon says: "It was in too great a hurry to form seed to meet my expectations as a forage plant;" and as to that sown by Mr. McCoy, he "had a large flock of turkeys, and they took such good care of the rape that it required no further attention."

In Ohio some rape was grown in 1892 by W. T. Palmer, of Jeromesville. It was sown on a loose sandy soil, plowed in May, on which a heavy crop of mammoth clover had been grown the previous year, and was put in drills 3 feet apart. Mr. Palmer wrote in regard to it, on September 13: "I sowed the rape in June, and now it is about 3 feet high. The leaves have made a near approach between the rows."

In Michigan rape has been grown for one or more seasons by George E. Breck, of Paw Paw; W. Robertson, of Ypsilanti; W. J. Garlock, of Howell; and S. S. Bailey, of East Paris.

Mr. Breck has grown rape for three years. He sows it broadcast about July 10 on land where clover may have failed to catch the previous year. By September 15 it has made a good growth and furnishes an excellent fresh food at a time when it is needed. He pastures sheep on it, the rest of the field being in clover. The sheep prefer the rape to fresh clover. Mr. Breck adds:

> Rape grows and fattens sheep very satisfactorily. It furnishes at least twice as much food per acre for two months as the best of clover, is available at a time when pastures are short, puts sheep into a fine condition for sale or for breeding, and seems to be a natural and healthful food.

Mr. Robertson has grown from 10 to 15 acres of rape yearly from 1888 to 1892—that is to say, for four years. Nearly all of it was sown

after a crop of peas and oats, grown together, had been harvested for soiling uses. He has grown it both in drills and broadcast. When sown in drills they were made 28 inches apart, and 2 pounds of seed per acre were used. When sown broadcast 6 pounds were used. He has pastured sheep and in-calf cows and heifers on it. He has always had good crops except in 1892, when no rain fell from July until the end of September. Mr. Robertson states further: "It is a very valuable crop for feeding in October and November, both for cattle and sheep, when pastures are done. I am satisfied that all who grow it once will grow it again."

Mr. Garlock sowed rape in 1892. One of the two kinds, evidently the Dwarf Essex, did remarkably well, while the other variety which blossomed was of but little value. He sowed June 20, but thinks later sowing in moist weather would be better for fall feeding. Mr. Garlock adds: "I never had show sheep push ahead as those did on that feed. I believe wonderful results will follow rape-growing if we can get the genuine seed."

Mr. Bailey grew the Dwarf Essex rape in 1892 only. He sowed 6 pounds of rape seed on July 30, some in drills and some broadcast. Two pounds of seed per acre were sown in the drills. A portion of the land was sandy loam and a portion muck. It made a wonderful growth, some of it reaching the height of 3 feet by October. Corn drilled in at the same time and rye sown simultaneously made no showing in comparison; it literally covered the ground, and the sheep did well upon it. Mr. Bailey adds: "Had I known what I know now, I could as well have put in 25 acres. I desire to thank you for calling the attention of our people to the value of rape as a fodder plant."

In Wisconsin rape was grown by George McKerrow, of Sussex, in 1891 and 1892. It was sown in drills and broadcast, and a large crop was produced both seasons. In 1891 that sown June 15 gave the best crop, but in 1892 the later sowing of July 2 was superior. He has both pastured it and cut and fed it to rams and show sheep in the stable. Mr. McKerrow further mentions: "I consider it a good crop to furnish a good green fattening ration in the fall."

In Illinois rape was grown in 1892 by E. W. Hartley, of Christman. It was sown August 1 and did not prove a success, owing to the excessively dry weather.

In Minnesota rape has been grown by several farmers, including O. O. Monson, of Pomme de Terre; W. W. Kelly, of Lamberton; Fletcher Bros., of Minneapolis; and Thomas Kough, of Mower County. The two first-named gentlemen grew a variety which soon came into blossom, and they do not speak very highly as to its value. Fletcher Bros. grew rape in 1891 and 1892. They say in regard to it: "We will not be without it for our lambs if we can raise it successfully."

Mr. Kough has grown it every year since 1889. Sometimes it was sown on inverted barley stubble after the previous crop had been reaped. In 1890 rape sown broadcast stood over 2 feet high without stretching

the leaves. He has sowed it in corn fields at the time the last cultivation is being given the corn, and has found good results. Mr. Kough adds: "I consider one acre of rape worth more than 2 acres of flat and common turnips."

In Georgia A. H. Stoddard, of Savannah, grew rape as an experiment in 1892. He states his experience with it in the following language:

It grows well here in spring and summer, but is not needed at that time as a grazing plant. I sowed about 3 acres in September and October on a sandy soil with a view to growing winter pasture. It was not a success. It grew slowly.

THE GROWTH OF RAPE.

Owing to the limited experience that we have had in growing rape in America there is doubtless much that is yet to be learned as to the various ways in which it may be grown; but when its growth becomes general this knowledge will speedily increase. Happily we know enough in the meantime to enable us to grow it in fine form where the conditions are suitable.

ADAPTABILITY OF SOILS.

It would probably be correct to say that rape will grow in fine form in any soil that will produce an abundant crop of turnips or Indian corn. It will therefore grow freely in deep, rich, and warm loams, friable in texture. In sandy soils it will grow well, but only on the condition that they are well supplied with suitable plant food, otherwise its growth, though encouraging at the first, will be disappointing in the end. On stiff clays it will not germinate properly in dry weather, and its growth will be slow. On humus soils where vegetable matter abounds it grows with great vigor and luxuriance. Muck swamps, which have been drained, are capable of prodneing enormous crops. But rape will grow reasonably well on any soil that is moist, friable, and plentifully supplied with plant food in available form.

PLACE IN THE ROTATION.

The place that should be assigned to rape in the rotation will depend on many conditions—the use for which it is grown, the nature of the soil, and the nature of the rotation. Like other hoed crops it should be grown as a cleaning crop when sown in drills, hence it is peculiarly fitting to grow it upon fields which require to be cleaned. It will therefore more commonly come after a grain crop, and ordinarily should be followed by another grain crop sown with grasses and clovers. It may generally be grown with much advantage after a crop of winter rye, which has been pastured or cut at the earing stage for hay, or in the blossoming stage for the silo.

In climates that are suitable, and in seasons that are sufficiently moist, it will also make a good growth after early maturing crops. As

rape feeds ravenously on organic matter, it usually grows well on a freshly overturned sod possessed of sufficient moisture to germinate the seed. It may therefore be grown on land which has been pastured in early spring and on overturned clover fields after the first cutting of the season has been removed. As a catch crop it may be sown at any time when opportunity offers, until within, say, eight weeks of the close of the growing season. As a green manure it may also be sown at any time, but for this purpose it is more common to sow it in conjunction with the bare fallow or after some crop of the season has been removed.

PREPARATION OF THE SOIL.

A suitable seed bed for rape calls for fine pulverization, a surface soil free from undecayed vegetable matter, and sufficient moisture to germinate the seed. A fine pulverization is largely dependent on conditions of soil and climate and on the implements of tillage used. The vegetable matter growing on soils to be prepared for a crop of rape should be buried by careful plowing, which should also in some instances be deep, otherwise it will interfere with the ridging of the land when the rape is to be sown in ridged drills. An increase in moisture is secured through the occasional stirring of the soil with the harrow or cultivator sometime previous to the sowing of the seed. When rape follows rye that has been cut for hay, for soiling purposes, or for the silo, the ground should be carefully plowed, using the skimmer at the same time to bury all vegetable matter. It should then be at once rolled to impact the soil and so arrest the ascending ground moisture. The drills should be made with the double mold board plow, but not so elevated that they will readily dry out. The distances between the drills may vary from 20 to 30 inches. The width from drill to drill may be wider where the land is rich. The same mode of preparing the soil may be followed when the rape is to come immediately after a grain crop that has been allowed to mature. When rape comes after sod land plowed in June or after meadow land plowed late, it would probably be necessary to sow it broadcast or in drills on the level, owing to the difficulty in forming raised drills on such lands.

FERTILIZERS FOR RAPE.

Although rape will grow on many kinds of soil it gives the best results relatively on lands that are rich, and especially on those that are rich in organic matter. When the soil is deficient in plant food the rape grows slowly and lacks that deep green tinge indicative of highest vigor, the plants do not attain sufficient size, and the leaf turns yellow at an early stage, which indicates that nutrition is wanting and that the nutritive processes have been suspended too soon.

Rape responds vigorously to the application of barn-yard manure. As the value of rape is largely in proportion to the development of the

stem and leaf, it is not easily injured by being overfed. Nor is there danger that the manure so applied will be wasted, as the rape is a gross feeding plant, and therefore has much power to gather plant food in the soil. The manure should ordinarily be applied in the fresh state and not long before the sowing of the rape, and it should be incorporated with the soil by plowing or cultivating, or by a combination of the two.

Since barn-yard manure is so favorable to the growth of rape, we may safely conclude that on average soils complete fertilizers may be used with safety where fertilizers are required. But much, of course, depends on the soil. At this station we have found that nitrate of soda applied at the rate of 200 pounds to the acre gave better results than either superphosphate or muriate of potash, and also better results than when the nitrogenous phosphatic and potassic fertilizers were used in combination. But it would probably be otherwise on average soils. We also obtained excellent results from the application of 200 pounds of salt per acre when applied alone. Superphosphate when used alone has given satisfactory results in many instances. As rape very much resembles the turnip in its habits of growth, it will probably be found that animal phosphate applied in the line of the drill, but not directly in conjunction with the seed, will usually give results that are satisfactory. When grown broadcast, the superphosphate may be incorporated with the surface soil by the harrow when preparing the ground for the seed or in covering the same.

SEED AND SOWING.

Three methods of sowing have been adopted, viz, in raised drills, in drills on the level, and broadcast. Which of these methods would be preferable will depend upon the character and condition of the soil and the object sought. The effect of cultivation between the drills is the same with rape as with corn. The growth is stimulated in proportion to the amount of the cultivation given and to its timeliness. It follows, therefore, that when the soil is rich and clean the rape may be sown broadcast. When these conditions do not exist it should be sown in drills. The sowing in raised drills facilitates early and thorough cultivation, but the seed is more certain to germinate when it is sown in drills on the level.

When sown broadcast the work may be done by hand or with some form of grass seeder. When sowed in raised ridges an ordinary turnip drill will do the work well. It is drawn by one horse and sows two rows at once. For small areas a hand-drill will answer. When sown in drills on the level a grain drill may be made to do the work by using only some of the tubes, and when the drills are suitable a fertilizer may be applied at the same time. The amount of seed to use should be gauged by the condition of the soil and the nature of the weather. The quantity should be increased with the lack of moisture in the soil,

with the lack of good tilth, and with the absence of moisture in the atmosphere. When sown broadcast from 3 to 5 pounds of seed per acre may be used, and when in drills from 1 to 2 pounds.

The time for sowing the seed will vary with the object sought and the climate. It may be sown for soiling purposes in May in the States bordering on Canada and in Canada, and cut or eaten off when it is sufficiently advanced. It will grow up again and may be used a second time in the same manner, but ordinarily the best results are obtained in the latitudes mentioned when sown during the last half of June and the first half of July. When put in earlier, the hot suns of August seem to unduly hasten its maturity, as indicated by slow development and a lightness of tinge in the leaf.

CULTIVATION.

The cultivating of rape should commence as soon as it is well started in the rough leaf, and it should be repeated as frequently as possible until the rape has reached that stage of advancement which will not admit of further cultivation without injury to the plants. This stage is reached when the leaves of the rape have so far extended over the space between the rows that they would be trodden under foot by the horse or broken off by the whiffletree.

An ordinary cultivator will answer for doing the work, but one that will cut close to the line of the row without covering the plants will best serve the purpose in the earlier stages of the cultivation. The cultivation should be deep at first and should gradually become shallower as the roots of the plants develop. Level cultivation only is required. It is not usual to give the rape any hand hoeing or thinning, but where some kinds of noxious weeds prevail some hand hoeing along the line of the drills would well repay the outlay. When rape is thinned the plants attain a larger size, but at the price paid for work in this country it has not yet been demonstrated that labor thus expended would prove remunerative.

USES OF RAPE.

It has been mentioned that in Europe rape has long been grown for the pasture which it produces and for the oil which is made from the seed. It is not likely to be grown for the latter purpose on this continent in latitudes which are most favorable to the growth of the Dwarf Essex variety, for this reason, that it does not well survive the winter. It is probable, therefore, that on the northerly portions of the United States and the southerly portions of Canada it will be grown chiefly as a pasture. But experience has taught us, even now, that it may serve a good purpose when sown as a soiling crop, as a green manure, and as a cleaning crop, and further experience may yet reveal other uses to which it may be put.

RAPE AS A PASTURE.

Rape is unrivaled as a pasture for sheep in autumn in those parts of this continent where it can be successfully grown. As a fattening food in the field it is without a rival in point of cheapness or effectiveness. The sheep that pasture upon it do the harvesting in a most effective manner, and with but little cost to the owner; and the manure made from it is distributed over the field which produced the crop, and in a form which is readily available for the plants of the succeeding crops. While rape thus grown and fed does not add fertility to the soil, unless in the plant food which it brings up from the subsoil, it does not detract from the fertility when the sheep which eat it off are inclosed upon it. When rape can be successfully grown as a pasture the necessity for sending sheep and lambs to the market in a lean condition will be removed, and the numbers that may yet be fattened upon it in this country will only be limited probably by the inclination of the farmers and the demands of the market. Four to five millions of acres of arable land would suffice to grow rape enough to fatten all the sheep at present in the United States.

The manner of feeding off the rape when pastured by sheep and lambs is in outline as follows:

They should be tagged before being turned in upon the rape, or soon after, as they are liable to become purged to some extent at the first. They should not be turned in upon the rape when hungry at any time, as they may so gorge themselves that bloating, followed by death, may ensue. When they have access to an old grass pasture at the same time, the grass eaten by them is usually very effective in preventing scours and other disorders arising from impaired digestion. When the animals are once turned in upon the rape it is not necessary to remove them, unless in time of severe and prolonged storms of rain or sleet. At such times they may be given the protection of sheds when these are available, otherwise the shelter of a grove may prove of some service. After they have fed upon rape from two to two and a half months they will be ready for the market. When it is desired to carry on the lambs into the winter months after the season for pasturing is over, they will go on improving in fine form where the management is judicious. In other words, pasturing on rape is an excellent preparation for winter feeding.

The sheep or lambs should be visited two or three times a day by the shepherd. This may be done on foot when the flocks are small, but when feeding over large areas the aid of a saddle horse should be called in. When sheep get fat and heavy they are somewhat liable to roll over on the back and so perish. They do not require any water when feeding upon rape, but should have access to salt at will.

There is no limit to the numbers that may be put upon one field except its capacity to sustain them. The labor of hurdling does not seem necessary, as the sheep waste very little of the rape. When it has grown strong and rank they feed around the borders. Like an invading army of crawling insects, they make clean work as they go, but when the crop is light and thin they feed in any portion of it.

Cattle may be pastured upon rape, but through treading they destroy and waste it in a considerable degree; because of this it is better to remove them to an adjoining pasture when they have satisfied their wants. The results are usually very satisfactory when they are pas-

tured upon it in the day only, and fed in the stable or shed in the morning before going to the rape pasture. This is an exeellent way of making Christmas beef.

It is also more than probable that rape will prove an exeellent pasture for swine in eonjunetion with corn and other food adjuncts, but for this purpose it would require to be eaten off while the weather is still mild.

RAPE AS A SOILING CROP.

Rape has been found useful as a soiling crop, more especially in feeding stock rams and show sheep, milch cows, and swine. It may be fed freely to stock rams and sheep in preparation for the shows with excellent results. It gives tone to the system, puts on flesh rapidly, and preeludes the neeessity for feeding a heavy grain ration. The amount to be fed is also so completely under the control of the feeder that all danger from exeessive eating is completely obviated.

When fed to milch eows the milk flow is generous and free. It should be given to the cow after the milk has been removed. When the cows pasture upon it there is little danger that the milk will be tainted as when turnip tops are fed. Rape may thus be made to furnish a crop for the dairy after all other soiling erops are past their best. Swine are very fond of it and rape will prove of much service as an adjunct to other eoncentrated foods when the animals are confined to their pens. They have been known to leave grain in some instances to feed upon rape when the latter has been placed before them.

Rape will keep for a long time in early winter in heaps like cocks of hay. When cut and thus put up on the approach of winter it may be drawn and fed as desired, where the snows do not fall too deeply at that season of the year. For soiling purposes it may be found advisable to sow it broadcast to render the cutting process easier.

RAPE AS A CATCH CROP.

Rape is peculiarly adapted for being grown as a eateh erop, as, like the turnip, it grows better late rather than early in the season. When a grain crop, therefore, has failed from any cause whatsoever, there is ample time to plow the land and to sow rape upon it. In some seasons it may also be sown after harvest where autumn cultivation is practiced; that is, where it is customary to plow the land lightly after the crop has been reaped. It may then be sown broadcast or in drills as desired. The chief difficulty will arise from the dry weather, which sometimes prevails at such seasons, and which will so far hinder the proper germination of the seed. It may be sown among corn just before the last cultivation which is to be given to the corn. The shade furnished by the corn is favorable to germination. Under some conditions the corn may furnish too much shade, but ordinarily the rape will

get a good start before the corn is cut and will then grow vigorously after that season.

Rape may also be sown along with grain in the spring where the ground is not sown with grasses at the same time. It may be sown with the grain drill and may be allowed to fall before the tubes, or it may be sown by hand after the drill and covered by the roller. About 3 pounds of seed per acre may be used. Ordinarily the growth of the rape will not interfere with that of the grain crop, and it will grow vigorously and furnish excellent pasture after the grain has been cut. Sometimes, however, the luxuriant growth of the grain will prove fatal to the rape.

RAPE AS A GREEN MANURE.

As a green manure rape may be made to serve a useful end. Where the bare fallow system is practiced, rye may be sown in the autumn and plowed under in the spring when well grown. This may be immediately followed by the rape, which in turn could be plowed under before sowing a crop of winter wheat. This would be a cheap and effective way of renovating worn soils. A light dressing of nitrate of soda may be given to the rye in the early spring and superphosphate applied along with the rape. The rape could be eaten off before sowing the wheat if it were required for pasture. But where peas will grow a crop of peas will be more effective than a crop of rape.

Rape may be sown for manurial purposes by any of the methods described when speaking of it as a catch crop, but where the facilities are at hand it will probably be more profitable to use it as a pasture.

RAPE AS A CLEANING CROP.

As a cleaning crop rape has but few equals when it is grown in drills, owing to the season of the year at which it must be sown to obtain good yields and to the cultivation which it then requires. When rape is the only crop grown, the ground may be managed as a bare fallow from the preceding autumn until the time of the sowing of the rape. Nearly all kinds of weeds can be sorely harassed in this way, but more especially those which ripen their seeds early. The cultivation which follows while the rape is growing is peculiarly fatal to weeds of a later habit of growth. When rape follows a crop of rye cut green it is also peculiarly helpful in destroying weeds. The rye tends to smother the weeds and is cut before they mature their seeds. The plowing and cultivation which come later still further tend to complete the work of destruction. Growing rape in drills after a grain crop has been removed is also serviceable in destroying weeds, though not quite to the same extent as when it is grown by one or the other of the methods mentioned above.

PRECAUTIONS TO BE OBSERVED IN FEEDING RAPE.

There are some dangers connected with feeding rape which can not be overlooked without serious hazard. It has been mentioned when speaking of rape as a pasture that sheep should not be put upon it when hungry lest they should eat too much. The same is true of cattle. To avoid this danger, some feeders put the cattle on the rape only for a short time at the first and gradually extend these grazing periods until the animals may with reasonable safety be left upon the rape all the time.

With valuable breeding animals the practice would probably be a wise one which would have the sheep turned in upon the rape field after the dew had lifted and taken out of it at night before the falling of the dew. They would not be turned in again upon the rape in the morning until they had previously taken food from some other source.

When rape is fed as a soiling crop this danger may be completely avoided, since the amount to be given is then entirely under the control of the feeder.

Although grain is not usually required by sheep or lambs when feeding on rape, in time of frosts they may with advantage be given a feed of oats early in the morning from day to day, and when this practice has once been commenced it would probably be unwise to discontinue it. The tendency to certain digestive troubles apparent at such times would thereby be lessened.

The animals feeding upon rape should have access to salt at will. They seem to crave large quantities at such times, and when thus eaten freely it tends to prevent scours and is also in other ways helpful to digestion.

The dangers attendant upon pasturing upon rape are not so great in dry years. In such seasons there may be little or no loss, but in those of an opposite character the losses may be considerable, unless close attention is given to the animals when feeding it off, and it is well to take this into account when undertaking to grow rape for pasture.